PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improvements in and relating to Roller Bearings

I, HERMANN JOSEPH NEIDHART, a citizen of the Swiss Confederation of Rue Grand Pre 4, Geneva, Switzerland, do hereby declare this invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a roller bearing and to a method of producing the same as well as to a tool for carrying out this method.

The invention is concerned with an anti-friction bearing in which elastic roller bodies, for example of natural or artificial rubber are inserted pre-stressed between the races of the bearing, whereby this roller bearing offers to the movement of its races relative to one another a substantially constant resistance which neither increases nor diminishes appreciably with loading. In bearings in accordance with the invention the races are sufficiently rough to prevent wandering off of the said roller bodies in the axial direction and/or the slipping thereof in the circumferential direction of the races. One race is preferably grooved or fluted in the longitudinal direction, and the other race in the transverse direction to the direction of movement of the two races relative to one another. In cylindrical or conical bearings preferably the outer race is grooved circumferentially, and the inner race is grooved transversely. Alternatively the races may be roughened, for example by sand blasting, or they may be knurled.

The races and rollers may be cylindrical, or frusto-conical, or the races may be concave, for example, toroidal, and the roller bodies belled, for rotational journal or thrust bearings. The invention may, however, also be applied to bearings for translational movements, and in this case the races are flat and the roller bodies cylindrical. A flat inner race may then be supported on either side by roller bodies between parallel outer races. The inner race may alternatively have an I-profile and may be supported by cylindrical rollers rolling on its flanges and on both sides of its web against flat outer races which are parallel to the said flanges and web, respectively. The outer races may be formed by the inner faces of a box-like structure.

The resilient roller bodies are in the relieved condition of a substantially circular cross section, and in the pre-stressed condition flattened at their zones of contact with the said races.

Separating rollers of a material harder than the said roller bodies may be freely inserted between adjacent roller bodies and the inner and outer races, whereby adjacent roller bodies are prevented from directly contacting, and rubbing on, one another.

Conversely, it may be desirable in cases where the relative movement of the races with respect to one another is to be limited that the adjacent roller bodies contact one another directly, and by their mutual friction damp and limit the said relative movement of the races. Alternatively the limiting of the relative movement may be effected by stops fixedly arranged on the races, on which the said rollers abut. If desired a direct contact between abutments of the two races can be established in the moment when the said resilient roller bodies snugly contact a stop or stops on the said races, whereby an additional limitation of the said relative movement is formed.

The insertion of roller bodies of resilient material under pre-loading between the races may cause some difficulties which are, however, overcome by the method according to the present invention in which the resilient rollers are firstly placed into a cylindrical outer race, and then a fluted auxiliary body of a diameter equal to that of the inner race is inserted axially into the centre of the said outer race ahead of the said inner race, the flutes of the said body registering with the resilient roller bodies and gradually compressing and deforming the same into their pre-stressed shape owing to their inclined position converging in a point on the axis ahead of the front end of the said body. The said auxiliary body is followed immediately by the cylindrical inner

race, and is then removed, and ready for renewed use.

In order that the invention may be clearly understood and readily carried into effect, some embodiments thereof will now be described by way of example with reference to the accompanying drawings, in which:—

Fig. 1 is an end elevation, partly in section, of a journal bearing according to the invention, and

Fig. 2 is a longitudinal section thereof.

Fig. 3 is a longitudinal section of a conical journal- and thrust-bearing according to the invention.

Fig. 4 is a cross section of a translational motion bearing, and

Fig. 5 is a longitudinal section thereof.

Fig. 6 is a cross section of another translation motion bearing.

Fig. 7 is a longitudinal section of a belled roller rotary bearing.

Figs. 8 to 11 illustrate the method of assembling a cylindrical journal bearing, and the tool for carrying out this method.

Fig. 12 is an end elevation, partly in cross section, of a modified journal bearing according to the invention.

Fig. 13 is an end elevation of another embodiment of a journal bearing according to the invention.

Fig. 14 is an end elevation of yet another modification of a journal bearing according to the invention.

Fig. 15 is an end elevation of another embodiment of a translational motion bearing according to the invention, and

Fig. 16 is an end elevation of a modification thereof.

The embodiment illustrated in Figs. 1 and 2 of a bearing according to the invention has two cylindrical components 1, 2 arranged coaxially and rotatable in respect of one another, of which the first one is constructed as a shaft, and the second one as a sleeve. Of course both components could be made tubular. Between the components 1 and 2 the roller bodies 3 are inserted with pre-loading. Prior to their insertion between the components 1, 2 these roller bodies have an at least substantially round cross section. In accordance with the pre-loading imparted to the roller bodies the same offer more or less of a resistance to the relative rotation of the components 1, 2 owing to molecular rearrangement taking place within these roller bodies which is however unaccompanied by further external deformation. Such bearings may accordingly find application up to a certain extent as motion dampers.

In a bearing of the kind described it is of particular advantage if careful attention is paid that the roller bodies actually roll on the races of the components 1, 2 and do not slip thereon. For this purpose the races may be roughened, knurled, grooved, etc. Even by the choice of suitable materials a surface finish can be attained which prevents slipping, in that materials having a high coefficient of friction are used. Moreover the races may have a surface finish imparted to them by sand blasting treatment, knurling, etc., which prevents any slipping or wandering away of the roller bodies.

While in Figs. 1 and 2 cylindrical components 1, 2 are provided, conical or frusto-conical components may instead be provided according to Fig. 3. The outer component 2^1 could for example be made funnel shaped, and cooperate with a conical or frusto-conical inner component 1^1.

Cylindrical as well as conical bearings can be subjected, in addition to a radial loading, to a certain axial loading, and are therefore suitable for example as pivot pin supports in railway bogies with pivot loading.

As shown in Figs. 4 to 6 the principle of the invention can be applied not only to bearings carrying rotary components but also to bearings for the support of translationally moving components.

Fig. 4 for example shows the cross section of a bearing structure, in which an inner component 4, which is formed, e.g., of flat iron, is supported by means of rubber rollers 5 on an outer component 6. This outer component could be formed for example by an angular profile tube or by flat irons, the latter being spaced from one another by threaded bolts. As will be seen from Fig. 5, on each side of the inner component 4 two roller bodies 5 are inserted pre-loaded. According to the actual conditions more or less such roller bodies can be provided.

Fig. 6 shows a similar construction, in which an I-profile inner component 4 is slidably guided in a rectangular outer component 6, and is supported by means of the roller bodies in two directions. Here, too, in the longitudinal direction of the components 4 and 6 any number of roller bodies desired in the actual circumstances can be arranged in series.

Fig. 7 shows another embodiment with concave races, between which belled roller bodies 3^1 are arranged. Obviously in this embodiment, too, care is to be taken that the races of the inner component 1 and of the outer component 2 have a surface finish which prevents any slipping of the roller bodies. Any wandering off of the roller bodies in the axial direction is not possible anyway.

According to actual requirements, the elastic roller bodies may be distributed uniformly or irregularly.

The insertion of the roller bodies of elastic material under pre-loading may cause some difficulties. In order to obviate the same in the assembling of bearings having cylindrical outer and inner components, advantageously an auxiliary body, a so called "distributor," is

used. The method of assembling such a bearing as well as the device used therefor will now be described with reference to Figs. 8 to 11 of the drawings.

The inner tubular component is denoted 1, the outer one is denoted 2, and the roller bodies are denoted 3. The latter are placed into the outer tubular component and thereafter the auxiliary body 8 is fitted into the inner tubular component 1 or screwed on to the same, and then the latter, together with the auxiliary body which conveniently has the same diameter as the inner component, is pushed into the outer tubular component. The auxiliary body has on its circumference longitudinal flutes 9 as will be seen from the cross section shown in Fig. 9 and from the longitudinal section according to Fig. 8. These longitudinal flutes 9 run in the longitudinal direction of the body 8, and converge towards the free end thereof. When inserting the auxiliary body into the outer component 2, the roller bodies 3, which conform as regards their number with the number of the flutes, come to lie in the flutes 9, and owing to the inclination thereof, the same can be inserted without difficulty, if desired with the aid of a lubricant which can be easily removed subsequently, the body 8 being pushed in the direction of the arrow (Fig. 8). As soon as the inner component 1 has been brought into the position desired, the auxiliary rod is removed; it can be used then for the assembling of the next bearing.

The disposition of the longitudinal flutes 9 may be uniform or irregular, according to whether it is desired to bring the roller bodies into regular or irregular intervals from one another.

It may be convenient to provide between the roller bodies so called blocking or separating rollers which prevent adjacent roller bodies of rubber to touch, and to rub on, one another. Such an embodiment is shown in Fig. 12 in cross section. As will be seen, between the roller bodies 3, there are rollers 7 loosely inserted between the components 1 and 2 which may be cylindrical or conical, the said rollers 7 being hollow or solid as desired, and consisting for example of metal, wood, artificial material or the like. The rollers 7 may be combined in a cage, provided that thereby their rotation about their own axes is not affected. The provision of such rollers 7 prevents adjacent rubber bodies 3 from coming into contact with oppositely moving surface portions and from being damaged thereby.

In some cases however, the motion intended to be performed lies within a predetermined range which is often very small. In this case it may be, conversely, desirable to cause the roller bodies to rub on one another. Alternatively stops may be built into the bearing proper, and the casing, too, may be used as an abutment.

In Fig. 13 stops 10 are arranged mutually offset on the inner race 1 and on the outer race 2, the shape of which is such that the rollers 3, upon abutting on the said stops 10 owing to the relative turning of the components 1 and 2 as indicated in Fig. 13 by arcuate arrows, contact the said stops 10 snugly along their whole length. The relative movement is thereby kept within predetermined limits.

According to Fig. 14 the limitation of movement can be alternatively effected in that the roller bodies mutually lock one another by more or less strongly abutting on one another at places 12. The bearing then permits movements in the direction intended to such an extent only as provided by the resiliency of the rollers or by their mutual friction.

Fig. 15 shows stops similar to those according to Fig. 13. The rollers 3 abut on the one hand on these stops 10, and on the other hand on the casing 16.

According to Fig. 16 the device can be so constructed that at the moment of the rollers snugly contacting the stops, the inner component 4 abuts on the outer component 6, whereby an additional stop is formed.

As will have been noticed the embodiments according to Figs. 15 and 16 are for translational movement of the inner component relative to the outer component.

What I claim is:—

1. Roller bearing with pre-stressed rollers of elastic material inserted parallel to the axis of the bearing between opposite faces of relatively movable bearing parts with their axes normal to the direction of relative movement, the distance between the inner and the outer of the said faces being less than the diameter of the elastic rollers before insertion so that the inserted elastic rollers exert pressure only radially in a direction normal to the relative movement of the said faces in which the surface of the said races is sufficiently rough to prevent wandering off of the said rollers in the axial direction and/or the slipping thereof in the circumferential direction of the races.

2. A roller bearing according to claim 1, wherein one race is grooved or fluted in the longitudinal direction, and the other in the transverse direction to the direction of movement of the two races relative to one another.

3. A roller bearing according to claim 2, wherein in a cylindrical or conical bearing the outer race is grooved circumferentially and the inner race is grooved transversely.

4. A roller bearing according to claim 1, wherein the races are knurled.

5. A roller bearing according to claim 1, wherein the races and rollers are cylindrical.

6. A roller bearing according to claim 1, wherein the races and rollers are conical or frusto-conical.

7. A roller bearing according to claim 1, wherein the races are concave or toroid and the rollers are belled.

8. A roller bearing according to claim 1 for translational movements, wherein the races are flat and the rollers are cylindrical.

9. A roller bearing according to claim 8, wherein a flat inner race is supported by rollers on either side between parallel flat outer races.

10. A roller bearing according to claim 8, wherein an I-profile inner race is supported on both flanges and on both sides of the web by rollers against flat outer races parallel to the said flanges and web, respectively.

11. A roller bearing according to claim 9 or to claim 10, wherein the outer races are formed by the inner faces of a box shaped body.

12. A roller bearing according to claim 1, wherein the said rollers in the relieved condition have substantially circular cross sections, and in the pre-stressed condition are flattened at their zones of contact with the said races.

13. A roller bearing according to claim 1, wherein spacer rollers of a harder material than the said resilient rollers are freely inserted between adjacent resilient rollers and the said races, whereby mutual contact between adjacent resilient rollers is prevented.

14. A roller bearing according to claim 1, wherein adjacent resilient rollers contact one another directly, whereby the relative movement of the said races is damped and/or limited by the friction between said adjacent resilient rollers.

15. A roller bearing according to claim 1, wherein the relative movement of the races is limited by internal stops provided on the said races against which the said rollers abut.

16. A roller bearing according to claim 15, wherein the said stops are mutually off-set on opposite races.

17. A roller bearing according to claim 15, wherein the said stops are part of the bearing casing.

18. A roller bearing according to claim 17, wherein the inner race abuts in the direction of movement on a stop of the outer race in the condition in which the said resilient rollers snugly contact a stop of the said outer race, whereby an additional abutment is formed.

19. A method of assembling a roller bearing in accordance with claim 18 in which the said resilient rollers are firstly placed into the outer race and then a tool comprising a fluted auxiliary body is inserted in the centre of the said outer race ahead of the cylindrical inner race thereof, the said resilient rollers gradually compressed to their prestressed shape by the inclined position of the flutes of the auxiliary body which is then removed.

20. A method according to claim 19 in which the said auxiliary body is of the same diameter as the end face of the cylindrical inner race of the bearing and is fluted longitudinally to a depth increasing from its point of insertion in the said inner race to its forward end.

21. A roller bearing as claimed in claim 1, substantially as herein described with reference to any one of the embodiments illustrated in the accompanying drawings.

22. A method of assembling a roller bearing as claimed in claim 19 or claim 20, substantially as herein described with reference to Figs. 8 to 11 of the accompanying drawings.

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Fig.1

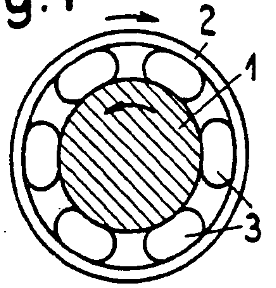

Fig.4

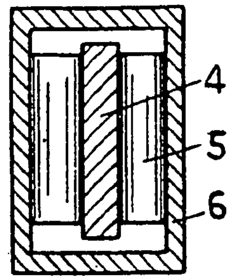

Fig. 6

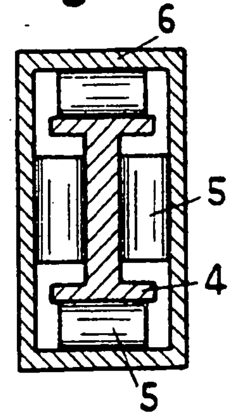

Fig. 2

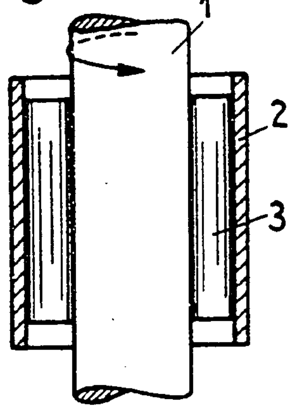

Fig.5

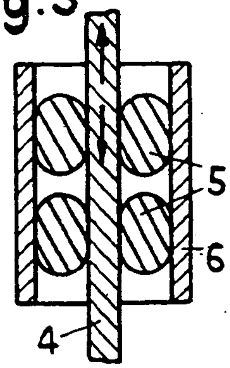

Fig.7

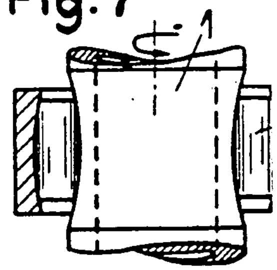

Fig.3

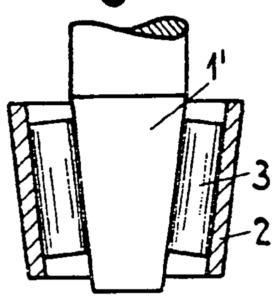

Fig.10

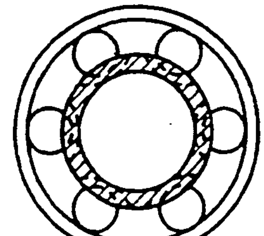

Fig.12

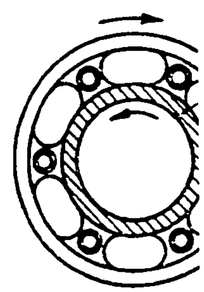

Fig.8

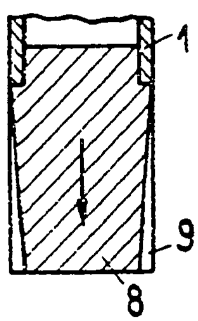

Fig.9

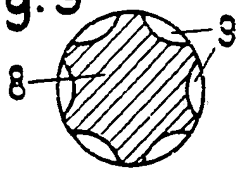

Fig.11